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three, four or five months. Her last complaint was generally relieved by a few saponaceous pills.

I am,

S I R,

Your obedient humble Servant,

Leicester, Feb. 19,
1766.

Robert Smith.

Received March, 1766.

XIV. *Experiments on the Peruvian Bark, by*
Arthur Lee, M. D.

Read May 1, 1766. **T**HE great object of experiments is to establish principles, on which practice may be conducted in the most expeditious and unerring manner. The intention, therefore, with which the following experiments on the Peruvian bark were made, was to confirm the pharmaceutic treatment of this medicine where it was just, to correct it where it was erroneous, or to improve it where it was defective.

Experiment I.

In the first experiment, I infused two ounces of the powder of Peruvian bark, in a pound and a half of distilled water; after 24 hours, it was filtered, and the
filtered

filtered liquor subjected to distillation in B. M. till about half came over, which was limpid and of a disagreeable slightly aromatic flavour: what remained in the retort deposited, on cooling, half a dram of a resinous substance, perfectly dissoluble in rectified spirit of wine: the liquor being then evaporated in B. M. left about three drams of a gummy substance intensely bitter and acerb.

Ob. It seems to appear from this, that the aqueous infusion contains the aromatic part of the bark, with a little of the resinous and a considerable quantity of the gummy substance.

Experiment II.

The residuum of bark, from the former experiment, after extraction for two hours, in B. M. with eight ounces of rectified spirit of wine, produced a tincture, which, when decomposed with water, left three drams and eighteen grains and a half of resinous matter. The water that was filtered from it was slightly bitter.

Ob. The bark therefore seems to contain three soluble parts, namely, the aromatic part, to be extracted by cold watery infusion, a gummy part, chiefly dissoluble in water, and a resinous part dissolved plentifully by spirit of wine. The quantity of dissolved matter obtained in the above experiments is in much greater proportion than in the experiments of Mr. Boulduc and Mr. Neumann. Dr. Lewis observes, in his notes upon Neumann, that different sorts of Peruvian bark differ considerably in their yield of extract, which, together with the heat used in making the spiritous extract, may account for this disparity
in

in my experiments and those of the gentlemen just mentioned.

Experiment III.

Two drams of a tincture obtained from one ounce of powdered Peruvian bark, with four ounces of rectified spirit, and filtered without pressure, gave two grains of resinous matter; but the same, when the filtration was finished, with pressure on the top, gave six grains of the same substance.

Ob. It may therefore seem advisable to use pressure always in filtering this tincture; and perhaps all the other tinctures would be rendered stronger by the same means.

Experiment IV.

Two drams of the powder of the external lamina of the bark, digested in the cold with rectified spirit of wine, afforded two grains of resinous matter.

Experiment V.

Two drams of the internal lamina, treated as above, gave a grain and half of resinous matter.

Ob. Though this single trial cannot determine the comparative quantity of resinous matter in each lamina; yet it may shew, that each of them contains it, which, as far as I know, has not yet been proved by experiment.

Experiment VI.

Two tinctures were prepared from the same quantities of the same bark, and of the same rectified spirit of wine; but the one was digested two hours, in B. M. the other 24 hours in the cold: a dram of the former yielded three grains, and the same quantity of the latter one grain of resinous substance.

Ob. Were this experiment sufficiently authenticated, it would establish a great preference in favour of the method of extracting tinctures in B. M. not only from its producing them more strong, but from the much greater expedition with which the process is executed.

Experiment VII.

Half a dram of the powder of bark was infused for 24 hours in caustic volatile alkali; and the tincture produced did not effervesce with acids, but retained a volatile-alkaline smell.

Ob. Is it therefore probable that the caustic volatile-alkali does not attract fixable air from the bark?

Experiment VIII.

When some of an aqueous infusion of the bark was poured to some caustic volatile-alkali; a white cloud appeared at the bottom of the phial, which soon disappeared, and the liquor became of a high reddish colour, without shewing any effervescence with acids.

Experiment IX.

Lime water and powdered bark, being macerated in the proportion of ten ounces of the former to one of the latter, in a well stopped phial, and then filtered; neither affected the colour of violet paper, nor precipitated the corrosive sublimate from its solution in water.

Ob. This experiment was made a year before Mr. McBride had published his very ingenious essay on the dissolving power of quick lime. The view with which it was made, was to determine, whether, after
infusion,

infusion, the lime water remained unaltered in its alkaline properties. And though I then conceived the reduction of the quick-lime to arise from the attraction of fixable air, yet it was by no means with that clearness and certainty, which arise from Mr. McBride's experiments. This experiment was repeated several times, with the same event.

Experiment X.

Lime water being poured to a watery infusion of the bark, gave it a high colour, and they remained pellucid; they tinged violet, green; and were distinctly alkaline and bitter. These things were observable for some hours after the mixing them.

Ob. This experiment seems to shew, that the air of the bark in substance, which reduces the quick-lime, does not enter into the infusion, or else adheres to it so firmly, that it cannot be similarly attracted by the quick-lime.

Experiment XI.

A cold infusion in common water produced no change on the syrup of violets.

Ob. I have somewhere seen it asserted, that the infusion turned violet, green; from whence an alkaline quality was inferred; to examine the truth of which, this experiment was made.

Experiment XII.

Half an ounce of powdered Peruvian bark was infused for 24 hours, in six ounces of a solution of sal ammoniac; when the menstruum had received a slight colour, but still remained clear and saline as before.

Experiment XIII.

Six ounces of a solution of common salt, infused for 24 hours, with half an ounce of the powder of bark, received from it a deep red colour, but retained its saltish taste.

Ob. It was intended, that the two above experiments should shew, whether the salt was precipitated from the water, during the solution of the bark.

Experiment XIV.

A well-saturated tincture of bark, with rectified spirit of wine, being added to lime water in the proportion of one third, suffered an immediate decomposition of its resin, as by common water; and in an hour, it made no change on the colour of violet paper.

I was in doubt here, whether the decomposition might not arise from an affinity between lime water and spirit of wine, as in common water; to determine which, I made the following experiment.

Experiment XV.

The pure resinous substance of the bark, put into lime water, was immediately dissolved, and the lime water reduced.

Ob. There seems therefore to have been a double elective attraction in the fourteenth Experiment. That is, the quick-lime, attracting fixable air, was reduced; and the water, uniting with the spirit, the resin was precipitated. Yet it is an objection to this supposition, that Mr. McBride's experiments prove the solution of resins to be attended with the loss of their fixable air.

Expe-

Experiment XVI.

Vitriolic acid dropped into the solution (Exp: 15.) precipitated its resin.

Experiment XVII.

Common water dropped into the solution (Exp: 15.) united with it uniformly.

Experiment XVIII.

Five grains of the resinous part were agitated with one ounce of water, and one grain was dissolved.

Experiment XIX.

Five grains of the resinous part, being rubbed with an equal quantity of fresh quick-lime, and agitated with an ounce of water, were all dissolved to one grain.

Ob. The very ingenious discovery of Mr. M^cBride, regarding the abstraction of fixable air in the solution of resinous bodies, sufficiently explains these experiments.

Experiment XX.

A dram of bark was infused for 24 hours in an ounce and an half of spirit of wine, then filtered, and the tincture decomposed with water, and again filtered, so as to leave the resinous part in the filtre; the gummy part which passed the filtre, turned a solution of green vitriol, black. The resinous part was agitated with water, to purify it from any adhering gum; and what passed the filtre a second time, gave a very light tinge of black to the solution of vitriol.

Experiment XXI.

The resin, obtained as above, was rubbed with quick-lime, and then dissolved in water, which solution, when

when filtered, gave a manifest black tinge to the solution of vitriol.

Experiment XXII.

The officinal decoction, when cold, gives an evident black colour to the solution of vitriol.

Ob. Dr. Lewis observes, that the decoctions of the bark affect the solution of vitriol in a much slighter manner than the cold infusion; from whence he infers, that the latter is more fully impregnated with the vegetable gummy matter than the former. I cannot say that I have observed any difference in the colour they strike with the solution of vitriol, and am inclined to think, the resinous as well as the gummy part possesses this power.

Experiment XXIII.

The matter, which had subsided from an officinal decoction, and which appeared to be purely resinous, dissolved in rectified spirit of wine, changed the solution of vitriol to a black colour.

Ob. The spirit of wine alone produced no change in the solution of vitriol.

Experiment XXIV.

Three parcels of bark, of half an ounce each, were infused in equal quantities of the proof spirit of the shops; after 24 hours one portion was filtered; another after 48 hours; and the third after 72 hours, or three days. The same quantity of each filtered liquor was united with equal quantities of the solution of vitriol; and after the decomposed matter had perfectly subsided, the united liquors were each passed through three filters of the same weight, which, when dried, were weighed

weighed again, and found to be perfectly equal, each having gained six grains of additional weight.

Ob. The common practice of prolonging the infusion to three days at least, is always tedious, frequently inconvenient, and, if we may trust this experiment, not necessary, because not useful, since the menstruum appears to have been as fully impregnated after one day's infusion, as after three.

Experiment XXV.

Three parcels of the same powdered bark were put, with six ounces of water to each, to infusion at the same time. After twelve hours the first was filtered, the second after twenty four, and the third after six and thirty hours infusion. The filtered liquors were not discernibly different in colour and taste, nor in a residuum obtained from each, as in Experiment 24, was there any perceptible inequality on the scale.

Ob. This experiment may direct our practice in preparing the cold watery infusion with more precision than is commonly known. I apprehend too, that it may further serve to amend our pharmaceutical practice in many other similar points, in which our veneration for the antients has induced us to acquiesce in their forms, which they did not found upon experiment, the only admissible test of their propriety.

These are all the pharmaceutic experiments I have hitherto made on the Peruvian bark; they were intended as a part of a compleat history of this medicine, which, though almost finished, an unexpected and indispensable call into my own country, prevents me from making public. I will just beg leave to subjoin a remark, concerning the tincture of the bark
with

with rectified spirit of wine, prepared by heat. I found the filtered water, made use of to precipitate the resin, so strongly impregnated, as to be more intensely bitter than the watery infusions; from whence I conclude, that spirit dissolves not only the resinous, but the gummy part, more powerfully than water; and as it is a more expeditious way than common decoction or infusion, it might be more eligible for preparing the officinal extract. I have remarked too, that, after one such extraction, the remaining bark is almost wholly insipid, which shows how great the extracting power of spirit is, when aided by heat. In making this tincture, it is necessary that the stopper be taken out of the phial, a little after it has been in the heat, to let the extricated air escape, so that it may afterwards continue stopped without any danger.